MAP REPORT 86-1

GEOLOGY OF SISSON BRANCH RESERVOIR MAP AREA

(NTS 21 O/6)

NEW BRUNSWICK

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ABSTRACT

The Sisson Branch Reservoir map area, northwestern New Brunswick, is located within the Aroostook-Matapedia and Tobique tectonostratigraphic zones. The Rocky Brook-Millstream Fault separates the two zones.

The Aroostook-Matapedia Zone comprises (1) a thick Ordovician distal turbidite suite (Grog Brook Group); (2) an Upper Ordovician-Lower Silurian calcareous turbidite sequence (Matapedia Group); and (3) a proximal turbidite sequence (Unnamed Unit). The McKenzie Gulch Fault separates the first two sequences.

The Tobique Zone consists of Lower Devonian shallow-water, marine sedimentary rocks with intercalated porphyritic and amygdaloidal mafic, and porphyritic and spherulitic felsic volcanic rocks (Wapske Formation). Intrusive rocks comprise diabase and gabbro sills and dykes.

The supracrustal rocks are folded into gently plunging, northeast-trending, upright and open to tight folds that are related to the Acadian Orogeny.

RÉSUMÉ

La région couverte par la carte Sisson Branch Reservoir est située au nord-ouest du Nouveau-Brunswick, dans les zones tectonostratigraphiques Aroostook-Matapedia et Tobique. Ces deux zones sont séparées par la faille Rocky Brook-Millstream.

La zone Aroostook-Matapedia est constituée 1) d'une épaisse série de turbidites distales ordoviciennes (le groupe de Grog Brook); 2) d'une séquence de turbidites calcaires ordoviciennes supérieures - siluriennes inférieures (le groupe de Matapedia); et 3) d'une séquence de turbidites proximales (une unité sans nom). La faille McKenzie Gulch sépare les deux premières séquences.

La zone Tobique est constituée de roches sédimentaires marines d'eau peu profonde du Dévonien inférieur, intercalées de roches volcaniques mafiques porphyriques et amygdaloïdes et de roches volcaniques felsitiques porphyriques et sphérolitiques (la formation de Wapske). On y trouve comme roches intrusives, des filons-couches et des dykes de diabase et de gabbro.

Les roches supracrustales sont inclinées faiblement en direction du nord-est, en plis droits allant d'ouverts à serrés qui ont été formés au cours de l'orogenèse acadienne.

GEOLOGY OF SISSON BRANCH RESERVOIR AREA

NEW BRUNSWICK

INTRODUCTION

The Sisson Branch Reservoir map area lies between St. Quentin and Riley Brook and is readily accessible by a road that connects these communities. Numerous logging roads throughout the area are the best sources of bedrock exposure with the exception of a few streams.

Prior to this survey, there had been little geological mapping conducted in the region. The most detailed map available was the Tobique geology map (Anderson 1962) on a one inch to two mile scale.

The authors would like to thank J.L. Davies, L.R. Fyffe, B.M.W. Carroll, and S.A. Abbott for editorial criticism and D. Blair for typing the manuscript.

PHYSIOGRAPHY

The Little Tobique River, in the eastern part of the report area, forms the boundary between the Chaleur Uplands and the Miramichi Highlands (Rampton et al. 1984). In the report area, the Miramichi Highlands, which lie to the east of the Little Tobique River, are underlain by Lower Devonian sedimentary, mafic volcanic and felsic volcanic rocks. The Highlands are characterized by steep hills and v-shaped stream valleys. Mount Carleton, the highest point in the province, lies just east of the report area.

The Chaleur Uplands are underlain by two clastic sedimentary sequences and a calcareous sequence. The older clastic sequence, the Ordovician Grog Brook Group, forms a broad ridge with broad flat stream valleys in the northwestern half of the map area. The calcareous sequence, the Matapedia Group, forms broad flatlands (the St. Quentin Plateau) in the central and northwestern parts of the map area (Figure 1). The younger clastic sequence, the Unnamed Unit, forms ridges within the flatlands.

The map area is drained by the Little Tobique River and the Sisson Branch which, in turn, flow into the Tobique River. Jardine Brook, in the northwestern corner of the map area, flows into the Restigouche River, and Salmon River, in the southwestern corner of the map area, flows directly into the Saint John River.

Figure 1. The ridge in foreground is underlain by the Grog Brook Group, whereas the flatlands beyond are underlain by the Matapedia Group. Village of St. Quentin is in centre of photo.

REGIONAL GEOLOGICAL SETTING

The Rocky Brook - Millstream Fault (Skinner 1953) separates two tectonostratigraphic zones in the report area (Figure 2). To the east of the fault lies the Tobique Zone, and to the west lies the Aroostook - Matapedia Zone (Davies 1979). The Tobique Zone comprises a northeast-trending belt of Devonian sedimentary and volcanic rocks of the Tobique Group (St. Peter 1978a) that extends from the Woodstock area in the south to the Upsalquitch River in the north, a distance of approximately 200 km.

The Aroostook - Matapedia Zone extends northeasterly from the Houlton area of eastern Maine (Pavlides 1968) to the Percé area of the eastern Gaspé Peninsula (Ayrton et al. 1969). In New Brunswick, the Aroostook - Matapedia Zone comprises the clastic sedimentary Ordovician Grog Brook Group, the calcareous Upper Ordovician-Lower Silurian Matapedia Group, and the clastic Silurian Smyrna Mills and Perham formations (St. Peter 1978a; Hamilton-Smith 1970, 1972). The stratigraphy of the report area is summarized in Table 1.

The rocks of the Tobique and Aroostook-Matapedia zones have been folded during the Acadian Orogeny (mid-Devonian) and have undergone subgreenschist facies regional metamorphism.

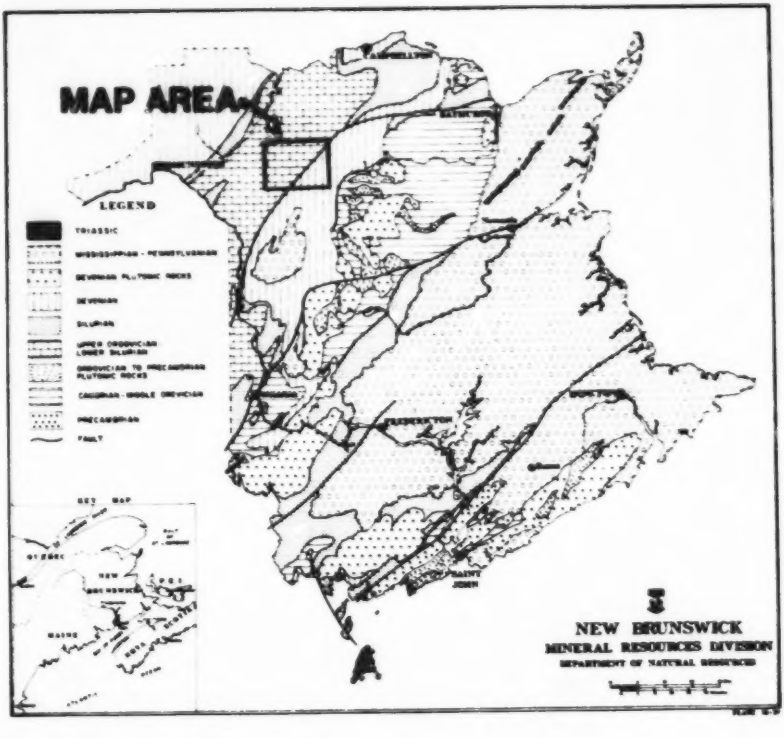

Figure 2. Index map showing location of Sisson Branch Reservoir area.

TABLE 1.
Table of Formations

ERA	SYSTEM/SERIES	FORMATION	MAP UNIT	LITHOLOGY
PALEOZOIC	Devonian		Dm	Dark grey to greyish green, medium- to coarse-grained gabbro
	Lower Devonian	TOBIQUE GROUP. Wapske Formation	Dmv	Dark grey to light green, fine- to medium-grained, massive, vesicular, and porphyritic basalt; minor basaltic tuff and basaltic breccia
			Dfv	Light grey and orange, porphyritic rhyolite and aphanitic rhyolite
			Ds	Green to greyish green, massive to parallel-laminated siltstone and slate interbedded with grey to greyish green, micaceous, slightly calcareous, quartzose sandstone; minor interbeds of limestone and quartz wacke
	Upper Ordovician-Lower Silurian	Unnamed Unit	OSu	Interbedded medium grey to greenish grey, thin- to medium-bedded, parallel-laminated, noncalcareous to slightly calcareous slate and light to medium grey, medium- to thick-bedded lithic wacke, conglomerate and quartzose sandstone; minor calcareous siltstone and crystalline limestone
		Matapedia Group	OSm	Interbedded medium to dark grey, thin-bedded argillaceous limestone, lithic limestone and shaly limestone; minor interbeds of calcareous siltstone and calcareous slate
	Ordovician	Grog Brook Group	Os	Interbedded, medium to dark grey, thin-bedded siltstone with light grey sandy laminations and light to medium grey, thin-bedded quartzose sandstone with silty laminations; minor interbeds of polymictic conglomerate, greywacke and quartzite

STRATIGRAPHY

ORDOVICIAN

Grog Brook Group (Unit Os): The Grog Brook Group was introduced by St. Peter (1978a) to describe a rock sequence that comprises interbedded conglomerate, greywacke, and argillite. The type section is exposed along Grog Brook in the Menneval area (N.T.S. 21 O/14) to the north of the Sisson area.

In the northwest part of the report area, rocks of the Grog Brook Group occupy a southwest-striking belt that is approximately 10 km wide. The best section is exposed along the road between Rang-Douze-Sud and Sisson Branch. Good exposures are also found along roads that parallel Salmon River and Middle Brook.

More than 90% of the Grog Brook Group exposures comprise an interbedded sequence of medium grey to dark grey, brown to greyish brown-weathering, thin-bedded, argillaceous siltstone with light grey sandy laminations and light to medium grey, brown-weathering, thin-bedded quartzose sandstone with dark grey silty to shaly laminations. Graded bedding and convolute laminations are common and the laminations and thin beds are locally boudinaged. In general, the rocks represent intervals b, d, and e of the Bouma Sequence (Bouma 1962). This lithology is consistent with rocks exposed to the north of the area (St. Peter 1978a) and to the southwest in the Grand River area (St. Peter 1975). Hamilton-Smith (1970) mapped similar rocks in the Siegas area.

Locally, minor interbeds of light green to medium grey, fine- to medium-grained greywacke are intercalated with argillaceous siltstone. Graded greywacke beds are exposed on logging roads west of the headwaters of Jardine Brook and along the Salmon River near the southwestern map border. The greywacke clasts comprise 50 to 60% quartz and quartzite, 15 to 20% feldspar, 10 to 20% black slate and other sedimentary and minor igneous rocks. North and northeast of the headwaters of the North Salmon River, light grey and light greenish grey, fine- to medium-grained quartz wacke is interbedded with the greywacke. The quartz wacke locally exhibits rare dark grey parallel laminations and cross laminations.

The rocks of the Grog Brook Group are typically noncalcareous, except near the contact with the overlying Matapedia Group. The McKenzie Gulch Fault (St. Peter 1978a) forms the eastern contact between the Grog Brook Group and the overlying Matapedia Group, whereas the western contact is gradational. Along the western contact, the rocks grade from noncalcareous siltstone and slate through a sequence of noncalcareous slate and argillaceous siltstone with minor calcareous slate, to a sequence having nearly equal proportions of calcareous and noncalcareous slates. Thin beds of polymictic pebble conglomerate grading to fine-grained greywacke are interbedded with the slate sequence near the contact. Exposures of the pebble conglomerate can be observed on the road from Rang-Douze-Sud to the Little Tobique River approximately 650 m south of the intersection with Highway 17.

The conglomerate is light to medium grey, light brown-weathering, and grades into fine-grained greywacke. The beds range in thickness from approximately 100 to 300 cm. The clasts comprise 50 to 60% quartz and quartzite, 15 to 20% feldspar, 10 to 20% slate, and 0 to 15% calcite and limestone. Intervals a, b, c, d, and e of the Bouma Sequence are evident. The thin bed form and the Bouma Sequence suggest that the Grog Brook Group was deposited as a distal turbidite sequence.

Although no fossils were found in the report area, graptolites and brachiopods found farther to the west and northwest by Hamilton-Smith (1970) and St. Peter (1978a), indicate an Ordovician age (Caradocian or Ashgillian) for the Grog Brook Group. The Grog Brook Group has been lithologically correlated with the Honorat Group of the Gaspé Peninsula (St. Peter 1978a; Nowlan 1983a).

A few kilometres south of Matapedia, Québec, the Grog Brook Group contains Late Ordovician (Late Ashgillian) conodonts (Nowlan 1983a). These conodonts have a color alteration index (CAI) of 1 to 1 1/2, whereas the conodonts in the supposedly overlying Matapedia Group have CAI values of 4 to 5, and rocks of the Silurian Chaleurs Group contain conodonts with values of 3 to 4. In order to maintain such low CAI values, the rocks of the Grog Brook Group could not have been buried as deeply as those of the Chaleurs Group. Nowlan attempted to explain these unusual CAI values by introducing Taconian thrust faulting for which there is little evidence in the region. It is believed that the rocks of the Grog Brook Group, Matapedia Group and Unnamed Unit are lateral and vertical facies variations within a deep basin; in some areas, rocks similar to the Grog Brook Group may overlie the Matapedia Group. Hence, it could be possible for conodonts in rocks similar to the Grog Brook Group to have lower CAI values than those of the Matapedia Group.

UPPER ORDOVICIAN-LOWER SILURIAN

Matapedia Group (Unit OSm): Skidmore (1965) showed that the calcareous Matapedia Group overlies the clastic Grog Brook Group. St. Peter (1978a) ascertained that the Matapedia Group is stratigraphically equivalent and lithologically similar to the Carys Mills Formation of the Siegas area (Hamilton-Smith 1970).

In the northwestern corner of the map area, the Matapedia Group conformably overlies the Grog Brook Group. In the central part of the map area, the Matapedia Group occupies a northeast-trending fault block bounded by the Rocky Brook-Millstream Fault on the east and the McKenzie Gulch Fault on the west. Good exposures of the Matapedia Group can be observed along the Big Cedar, Little Cedar, and Jardine Brooks and in railroad cuts in the northwestern corner of the map area (Figure 3).

Figure 3. Argillaceous and lithic limestone of the Matapedia Group exposed in a railroad cut near Jardine Brook.

The Matapedia Group comprises buff to greyish brown-weathering, dark grey to blue-grey, thin-bedded, lithographic, argillaceous limestone, interbedded with chalky- to buff-weathering, medium grey to blue-grey, parallel-laminated shaly limestone. The lithology represents intervals d and e of the Bouma Sequence. Intervals b and c are rare. Argillaceous limestone and calcareous shale beds often exhibit differential weathering to form "ribbon limestone" (Figure 4). Calcite veins and calcite-filled cross fractures are common in the argillaceous limestone beds.

Figure 4. "Ribbon limestone" of the Matapedia Group.

Near the top of the ribbon limestone sequence, a zone of reddish brown-weathering, manganese-stained, grey to greyish green, parallel-laminated calcareous siltstone (500 m thick) is interbedded with shaly limestone grading to noncalcareous slate. The calcareous siltstone has a characteristic conchoidal fracture and contains distinctive blebs of pyrite. In the northwest corner of the map area, in a railroad cut near Jardine Brook, the unit also includes lithic limestone containing sand- to pebble-size clasts. Lithic limestone is also well exposed just west of a pond on the headwaters of O'Dare Brook, a tributary of the Little Tobique River.

In the northwest corner of the map area near Jardine Brook, a sequence of lithic wacke, quartz wacke, siltstone and slate (20 to 30 m thick) forms a lens within the Matapedia Group. The wacke is light brown-weathering, light grey to brown on fresh surfaces, fine- to very coarse-grained and contains quartz grains, siltstone, limestone, and quartzite clasts, with minor felsic volcanic and chert clasts. There are also minor pyritic sulphide clasts throughout the wacke. Locally, the wacke has a calcareous matrix. Similar rocks in the central belt of Matapedia Group rocks have been divided into an unnamed unit (see below), but in the northwestern corner, the sequence is too thin to form a traceable unit.

Along the McKenzie Gulch Fault, a 400 m thick sequence, representing the upper part of the Matapedia Group, comprises greyish brown-weathering, light grey, noncalcareous to slightly calcareous shale and slate with thin interbeds of brown- to buff-weathering, dark grey to greyish blue calcareous siltstone and is in fault contact with the Grog Brook Group. A similar sequence of rocks is exposed along the Rocky Brook-Millstream Fault in the eastern half of the report area.

Rocks similar to the Matapedia Group are exposed in northern New Brunswick (St. Peter 1978a), the Gaspé Peninsula (Ayrton et al. 1969), and Maine (Pavlides 1968; Hamilton-Smith 1970). In Maine and in the Siegas area of northwestern New Brunswick, the rocks have been mapped as the Carys Mills Formation. In the southern Gaspé, the Matapedia Group is divided into an older Pabos Formation consisting of shales and a younger White Head Formation comprising relatively more limestone (Skidmore 1965).

No fossils were found in the Matapedia Group during the present survey, but similar rocks elsewhere in northern New Brunswick, the southern Gaspé and Maine contain graptolites, trilobites, and brachiopods indicating a Late Ordovician (Ashgillian) to Early Silurian (middle Llandoverian) age (Lespérance 1968, 1974; Riva 1981; Rickards and Riva 1981; Nowlan 1981, 1983b).

The rocks of the Matapedia Group represent a calcareous flysch or calcareous turbidite sequence deposited on a gentle slope. McIlreath and James (1979) describe similar lithologies as being deposited on hemipelagic slopes.

Unnamed Unit (Unit OSu): Three long narrow bodies of the Unnamed Unit are exposed within the Matapedia Group rocks in the central part of the report area. Good exposures of the unit are found along a logging road just south of Sisson Branch Reservoir, south of Big Cedar Brook, and along the Road to Resources in the northeast corner of the report area.

South of Sisson Branch Reservoir, Unit OSu comprises grey to greyish brown-weathering, light to medium grey, thin-bedded, parallel-laminated, noncalcareous to slightly calcareous slate and siltstone with thin interbeds of brown-weathering, greyish orange to grey, fine-grained quartzose sandstone varying to lithic wacke and conglomerate. The lithic wacke and conglomerate comprise 20 to 30% quartz and quartzite, 10 to 25% black slate, 10 to 20% light grey siltstone and slate, 10 to 20% mafic volcanic rocks, 5 to 15% felsic volcanic rocks and minor calcite, pyrite, and jasper.

Buff- and chalky-weathering, medium grey to dark grey-blue shaly limestone and calcareous siltstone of Matapedia Group lithology occur as thin interbeds within the Unnamed Unit and become more common near the Matapedia Group contact. The base of the Unnamed Unit is interpreted to be the occurrence of the first noncalcareous slate and siltstone beds.

On logging roads just south of Big Cedar Brook and north of the headwaters of Beaver Brook, Unit OSu comprises brown-weathering, dark grey to black, noncalcareous slates with light grey calcareous laminations. The slates are interbedded with a 20 to 30 m thick pebble conglomerate. The conglomerate contains clasts of subangular to subrounded quartz and quartzite, feldspar, limestone and fragments of corals and trilobites (Figure 5).

Figure 5. Pebble conglomerate of the Unnamed Unit exposed north of the headwaters of Beaver Brook.

On the Road to Resources, which cuts the northeastern corner of the report area, a number of conglomerate beds (10 to 30 cm thick) are interbedded with medium grey to greenish grey noncalcareous siltstone and slate and rare beds of calcareous siltstone. The conglomerate, which grades to fine-grained sandstone, contains clasts of angular slate, siltstone and conglomerate, mafic and felsic volcanic rocks, quartz grains, limestone and coral fragments and turquoise chert pebbles. The siltstone and shale, interbedded with the conglomerate, contain a number of trace fossils. The clastic sequence becomes more calcareous towards the east and west, near the contacts with the Matapedia Group (Figures 6 and 7).

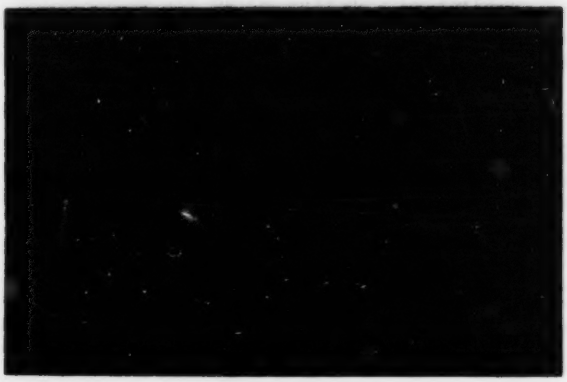

Figure 6. Graded bedding in sandstone of the Unnamed Unit.

Figure 7. Siltstone and shale of the Unnamed Unit.

Intervals a, b, c, d, and e of the Bouma Sequence are present in Unit OSu. Turbidity-current structures, lithology, and bedforms are typical of proximal turbidite sequences. Close lithological association with the Matapedia Group indicates that Unit OSu may represent a channel-fill sequence on a hemipelagic slope. This interpretation is supported by the presence of gradational contacts with the Matapedia Group.

A fossil locality within the Unnamed Unit, discovered by L.R. Fyffe along a logging road 3 km south of Big Cedar Brook at latitude 47° 26' 30" and longitude 67° 10' 00", yielded the following graptolites: Climacograptus of the normalis group and Dicellograptus cf. ornatus, indicative of the Dicellograptus anceps Zone of the Ashgillian of the Late Ordovician (J. Riva, written communication, 1983). Trilobites were also recovered by G. Crouse from the same location. The graptolites demonstrated that the Unnamed Unit is time-equivalent to the calcareous rocks of the Matapedia Group, although of quite different facies. St. Peter (1978a) included the northern extension of the Unnamed Unit in the Upsalquitch Formation and assigned a Llandovery age to it. West of the report area, similar rocks were included in the Siegas Formation by Hamilton-Smith (1970).

LOWER DEVONIAN

Wapske Formation: The Wapske Formation was originally defined by St. Peter (1978b) to include an interfingering assemblage of mafic volcanic rocks, sedimentary rocks and lesser felsic volcanic rocks that overlies the predominantly felsic volcanic Costigan Mountain Formation. The Costigan Mountain Formation and the Wapske Formation together form the Tobique Group. However, fossil evidence later indicated that the Wapske Formation was, in part, intercalated with the Costigan Mountain Formation (St. Peter 1979). In the report area, the Wapske Formation primarily comprises sedimentary rocks (Ds) with minor lenses of mafic volcanic (Dmv) and felsic volcanic (Dfv) rocks.

Sedimentary Rocks (Unit Ds): The sedimentary rocks of the Wapske Formation lie to the east of the Rocky Brook-Millstream Fault. They are at least 5,000 m thick and are best exposed along Sisson Branch, McDougall Brook and Everett Brook.

There are two sequences of sedimentary rocks in the Wapske Formation: an older sandstone-siltstone sequence and a younger siltstone-slate sequence. The sandstone-siltstone sequence is restricted to the east side of the Mamozekel River and along section from the Sisson Branch Reservoir Dam downstream for approximately 1,500 m. It comprises brown- to rusty brown-weathering, grey to grey-green, thick-bedded quartzose sandstone with thin interbeds of brown- to grey-brown-weathering, green to grey, noncalcareous siltstone and slate (Figure 8). The sandstone is medium- to coarse-grained, noncalcareous to slightly calcareous and near the

Sisson Branch Reservoir Dam varies to quartz wacke. In this area, the sandstone beds contain load casts, graded beds and parallel and cross laminations. The siltstone and slate beds gradationally overlie the sandstone beds and are commonly micaceous and rarely calcareous. Thin beds of bioturbated limestone are interbedded with the sandstone-siltstone sequence. Brachiopods and corals are well preserved within these limestone beds, and east of the Mamozekel River, sandstones commonly contain plant fossils.

The siltstone-slate sequence comprises thick-bedded, brown- to greyish brown-weathering, green to green-grey siltstone and slate. The siltstone is commonly massive to parallel laminated and may grade into a micaceous (rarely calcareous) slate. Red- to maroon-weathered siltstones occur near the Rocky Brook-Millstream Fault.

Figure 8. Sandstone-siltstone sequence of the Wapske Formation near the Sisson Branch Reservoir.

Similar sedimentary rocks are exposed along strike north and south of the report area. Fauna in the sandstone-siltstone sequence indicate deposition in a shallow, quiet-water, marine environment during the Helderbergian age (Boucot 1976; written communication to R.R. Irrinki). Local turbidity current structures found in the sandstone-siltstone sequence may have been formed due to local seismic activity associated with volcanism.

Felsic Volcanic Rocks (Unit Dfv): Felsic volcanic rocks form a narrow belt along the Serpentine Mountains. The volcanic sequence, which is approximately 400 m thick, comprises grey-orange aphanitic rhyolite and porphyritic rhyolite. The aphanitic rhyolite contains shards and is, in part, spherulitic. The spherulites range in size from less than 1.0 mm to greater than 5.0 mm. The porphyritic rhyolite

contains 15 to 20% pink feldspar and 5 to 10% quartz phenocrysts in a fine-grained matrix that contains a few shards. The aphanitic and porphyritic rhyolites are interlayered with rhyolite tuff that varies to rhyolite breccia. Similar rocks are found throughout the Tobique Zone.

Mafic Volcanic Rocks (Unit Dmv): Mafic volcanic rocks are exposed along a northeast-trending ridge parallel to the Little Tobique River just east of the Rocky Brook-Millstream Fault. The mafic volcanic rocks occur in at least three layers separated by beds of noncalcareous slates (3 to 6 m thick). Each volcanic layer is 30 to 100 m thick. The mafic volcanic layers commonly comprise dark grey to light green, fine- to medium-grained, vesicular and porphyritic basalt that locally grades along strike to basaltic tuff and basaltic breccia. In the northeast corner of the report area, the basalt is vesicular with calcite and chlorite amygdules. On a small tributary of the Little Tobique River, across from, and slightly north of Dead Brook, specular hematite is common in the amygdules.

DEVONIAN

Gabbro (Unit Dm): Dykes, 2 to 4 m thick, varying from fine-grained diabase to medium-grained gabbro are exposed in the eastern part of the report area. A sill, 20 to 30 m thick, composed of coarse-grained, dark grey to grey-green gabbro is exposed near the northeastern tip of Sisson Branch Reservoir (Figure 9). The sill has distinctive spheroidal weathering. A small stock of gabbro underlying approximately 1 km^2 is exposed just north of the aforementioned sill.

Figure 9. Spheroidal weathering in gabbro of Unit Dm near the northeastern tip of Sisson Branch Reservoir.

STRUCTURAL GEOLOGY

The Lower Devonian and older rocks have been affected by two generations of folds and northeast-trending and northwest-trending fault systems.

First folds (F_1) control the outcrop distribution of most of the lithologies within the report area (Section AA'). These folds have wavelengths ranging from a few millimetres to three kilometres, tight to open limbs, northeast-trending subvertical axial surfaces and gently northeast- or southwest-plunging axes. A slaty or fracture cleavage with a northeast-trending subvertical dip is parallel to the axial surfaces of these folds.

In order to determine the regional variation in bedding and cleavage orientation, the report area was divided into three subareas bounded by faults. Bedding and cleavage orientations from each of these subareas were plotted on separate diagrams. Poles to bedding in each of these subareas (Figure 10) lie on a girdle. In the area east of the Rocky Brook-Millstream Fault, the girdle axis indicates a plunge of 10° toward the southeast. In the area between the Rocky Brook-Millstream Fault and the McKenzie Gulch Fault, the girdle axis indicates 0° plunge. In the third area, which lies to the west of the McKenzie Gulch Fault, the girdle axis indicates a 10° plunge towards the southeast. The variation in bedding orientation in each of these areas is due to F_1 macroscopic folding. In all three areas, the poles to cleavage plots are almost identical (Figure 11).

Minor kink folds (F_2) with wavelengths ranging from a few centimetres to a metre are closely associated with faulting. These folds have open to gentle closures and north- to east-trending subhorizontal axial surfaces.

The northeast- and northwest-trending faults are prominent linears on Earth Resource Satellite Photographs and can be recognized in the field by minor faults, calcite veins and brecciation, sudden changes in bedding and cleavage orientation or by an abrupt lithological discontinuity.

The northeast-trending faults are the most prominent and some can be traced for over 100 km. Within the Sisson Branch map area, the Rocky Brook-Millstream Fault defines the contact between the Upper Ordovician-Lower Silurian sedimentary rocks and the Lower Devonian sedimentary and volcanic rocks. The McKenzie Gulch Fault separates the Ordovician Grog Brook Group from the Upper Ordovician-Lower Silurian Matapedia Group sedimentary rocks.

The northwest-trending faults are relatively minor and their effect on the distribution of the lithologies is not as well defined as with the northeast-trending faults. Movement along the northwest faults is right-handed strike-slip with a maximum displacement of 1 km (Figure 12).

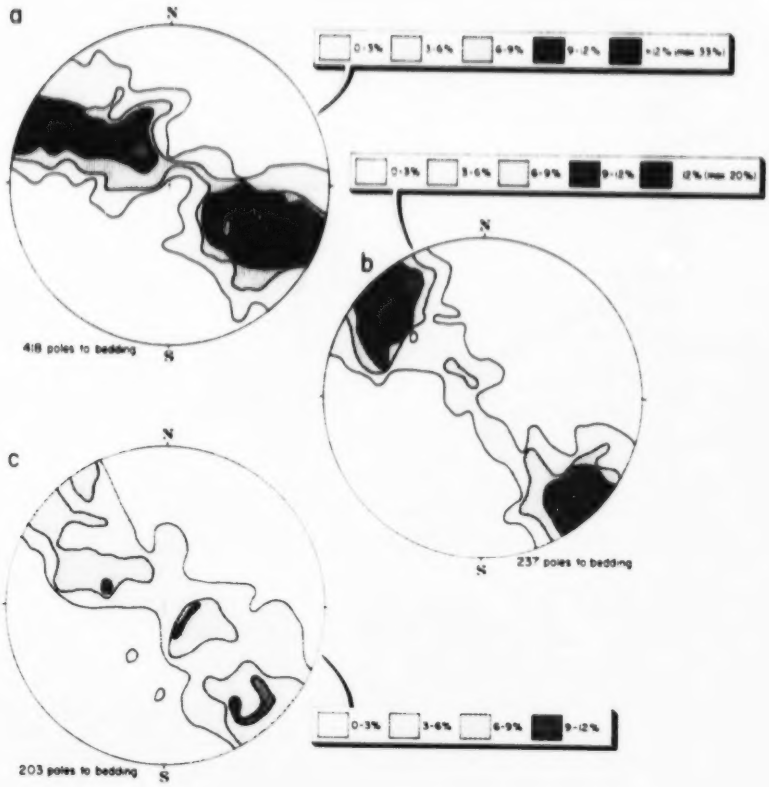

Figure 10. Contour diagram of poles to bedding in:

(a) the block east of Rocky Brook-Millstream Fault,
(b) the block between McKenzie Gulch Fault and Rocky Brook-Millstream Fault,
(c) the block west of McKenzie Gulch Fault.

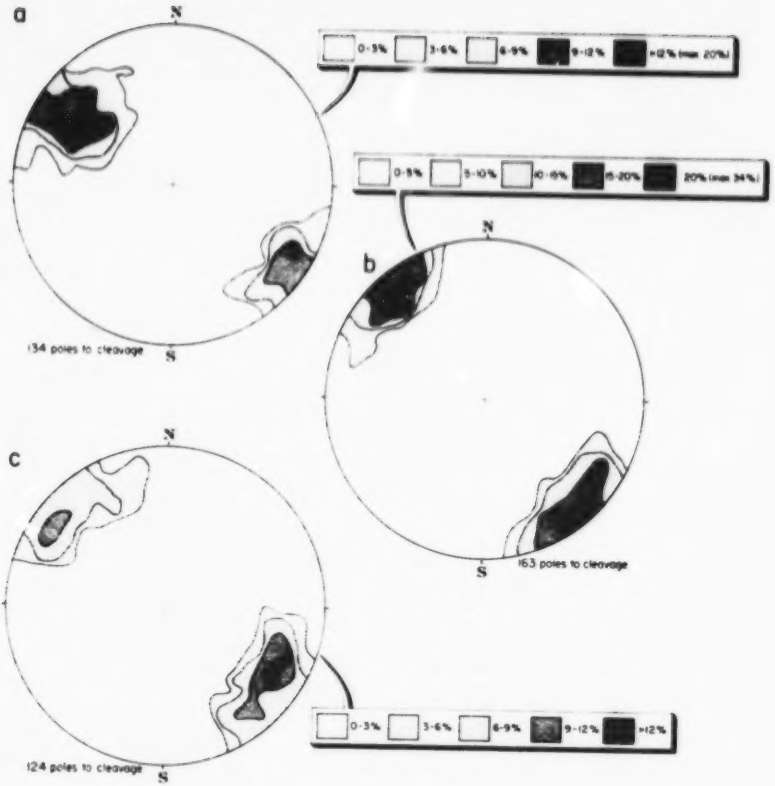

Figure 11. Contour diagram of poles to cleavage in:

(a) the block east of Rocky Brook-Millstream Fault,
(b) the block between McKenzie Gulch Fault and Rocky Brook-Millstream Fault,
(c) the block west of McKenzie Gulch Fault.

Figure 12. Northwest-trending fault near southeast tip of Sisson Branch Reservoir.

As indicated by the orientation diagrams (Figures 10 and 11), the deformation of the Ordovician and Lower Silurian rocks is very similar to the deformation of the Lower Devonian rocks. In this region there is no structural break between Ordovician and Lower Devonian. Nearly identical orientation diagrams of cleavage and bedding readings between each fault block indicate that there is no marked rotation of fabric due to post-F_1 faulting.

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PLATE 84 - 32

NEW BRUNSWICK
DEPARTMENT OF FORESTS, MINES & ENERGY
MINERAL RESOURCES DIVISION

67°30'
47°30'
25'
20'
15'
25'

Rang-Sept-et-Huit
Rang-Dix
Rang-Douze-Sud
Rang-Quatorze
Rang-Seize
A
OSm
Os
Os
OSm
HWY 17
Brook
Jardine
Ngaon Br.
GULCH
Cedar
Little
RESTIGOUCHE COUNTY
VICTORIA COUNTY

NEW BRUNSWICK
DEPARTMENT OF FORESTS, MINES & ENERGY
MINERAL RESOURCES DIVISION

20' 15' 10' 05'

Rang-Seize

Os

Os

FAULT

Big Cedar Brook

OSu

OSm

OSm

OSm

OSm

Brook Cedar

ROAD TO RESOURCE

Dmv

OSu

Ds

RESTIGOUCHE COUNTY
VICTORIA COUNTY

GULCH

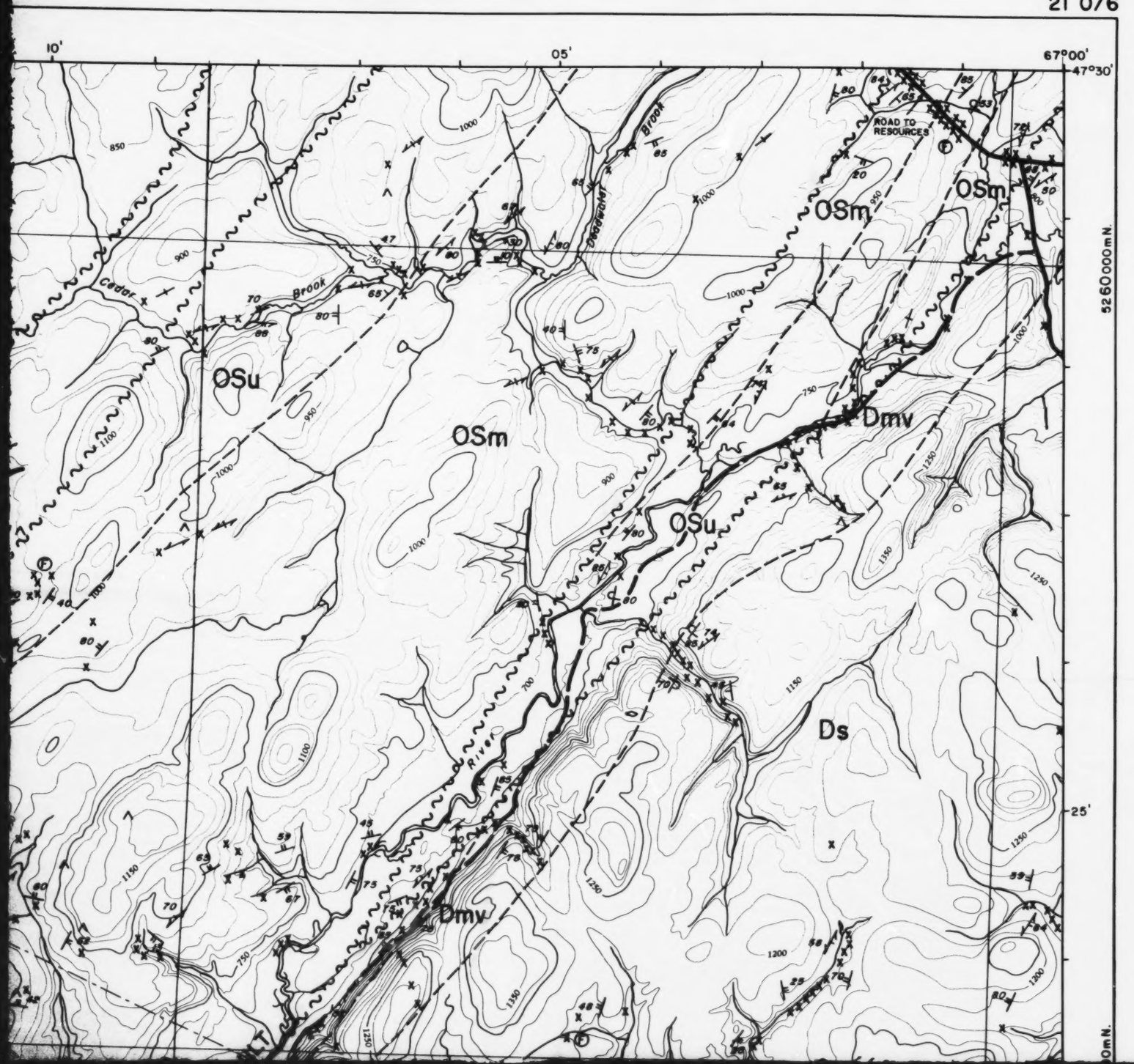
Cedar

RIVER

Dmv

FAULT

21 0/6



LEGEND

DEVONIAN

Dm — *Dark grey to greyish green, brown-weathering, medium- to coarse-grained gabbro*

LOWER DEVONIAN

TOBIQUE GROUP

Wapske Formation

Dmv, Ds, Dfv

Dmv, dark grey to light green, brown-weathering, fine- to medium-grained, massive, vesicular and porphyritic basalt; minor basaltic tuff and basaltic breccia

Dfv, light grey and orange, orange-weathering, porphyritic rhyolite and aphanitic rhyolite

Ds, green to greyish green, brown to greyish brown-weathering, massive to parallel-laminated siltstone and slate interbedded with grey to greyish green, brown- to rusty-weathering, micaceous, slightly calcareous, quartzose sandstone; minor interbeds of limestone and quartzwacke

UPPER ORDOVICIAN – LOWER SILURIAN

Unnamed Unit

OSu — *Interbedded medium grey to greenish grey, greyish brown- and maroon-weathering, thin- to medium-bedded, parallel-laminated, noncalcareous to slightly calcareous slate and light grey to medium grey, brown-weathering, medium- to thick-bedded lithic wacke, conglomerate and quartzose sandstone; minor calcareous siltstone and crystalline limestone*

MATAPEDIA GROUP

OSm — *Interbedded medium to dark grey, buff-weathering, thin-bedded argillaceous limestone, lithic limestone and shaly limestone, minor interbeds of calcareous siltstone and calcareous slate*

ORDOVICIAN

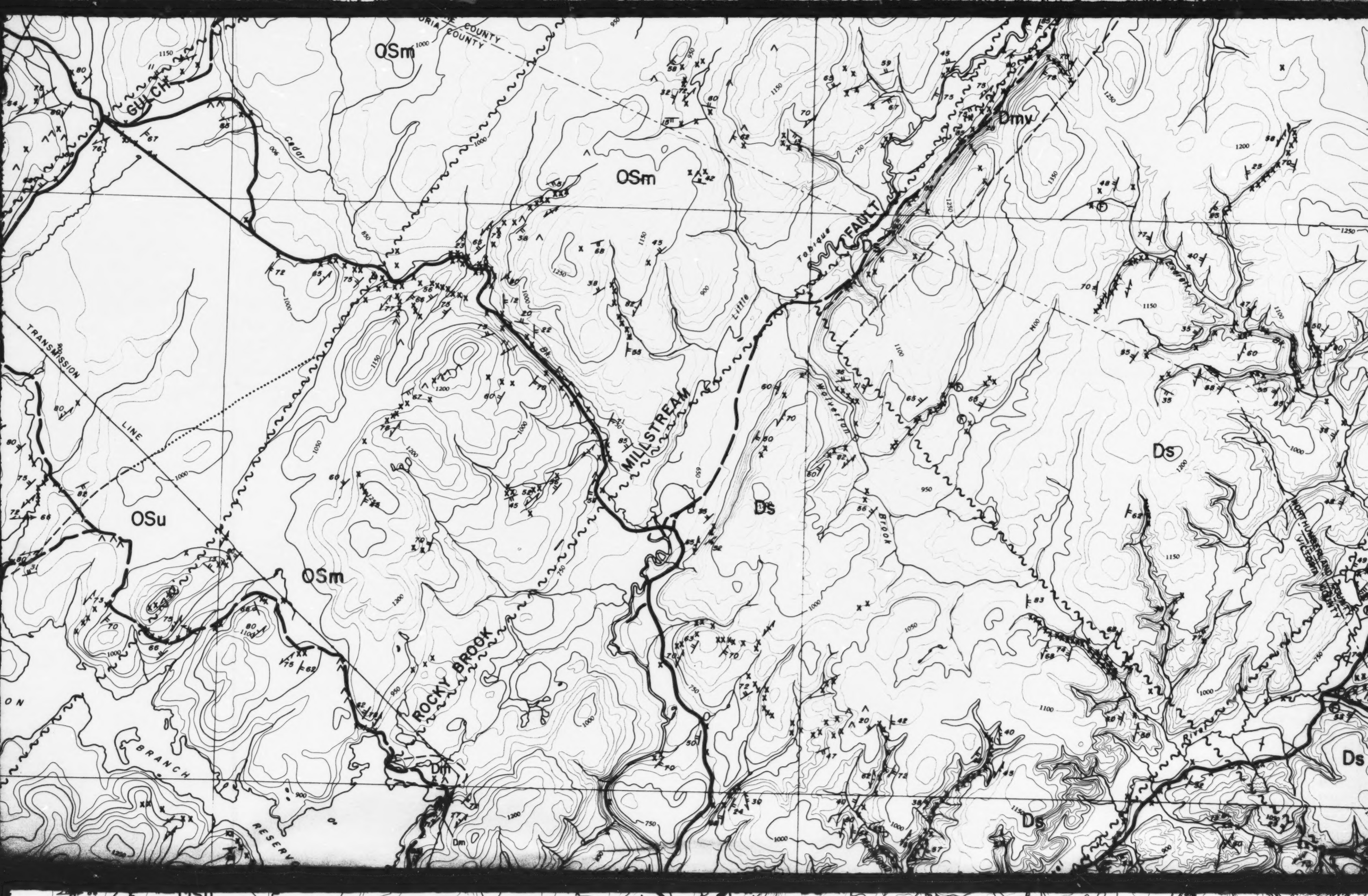
GROG BROOK GROUP

Os — *Interbedded medium grey to dark grey, brown- to greyish brown-weathering, thin-bedded siltstone with light grey sandy laminations and light to medium grey, brown-weathering, thin-bedded, quartzose sandstone with silty laminations; minor interbeds of polymictic conglomerate, greywacke and quartzite*

SYMBOLS

- *Bedding, tops known (inclined, overturned)*
- *Bedding, tops unknown (inclined, vertical)*
- *S_1, slaty or fracture cleavage and axial plane of F_1 minor folds (inclined, vertical, dip unknown)*
- *S_2, axial plane of F_2 minor kink folds (inclined)*
- *L_1, axis of F_1 minor folds (inclined)*
- *L_2, axis of F_2 minor folds (inclined)*
- *Outcrop, probable outcrop*
- *Geological boundary (approximate, assumed)*

Os
OSm
OSu
Dm
McKENZIE
TRANSMISSION
LINE
GULCH
Middle
Brook
Salmon
Price
SISSON
BRANCH
ROCKY BROOK
25'
20'


GULCH
Cedar
OSm
OSm
OSm
OSu
OSm
Dmv
Ds
Ds
Ds
Ds
Dm
Dm
FAULT
Tobique
MILLSTREAM
ROCKY BROOK
BRANCH
RESERVO
TRANSMISSION
LINE
Wolverton
BROOK
NORTHUMBERLAND
VICTORIA
COUNTY
COUNTY

S_1, slaty or fracture cleavage and axial plane of F_1 minor folds (inclined, vertical, dip unknown)

S_2, axial plane of F_2 minor kink folds (inclined)

L_1, axis of F_1 minor folds (inclined)

L_2, axis of F_2 minor folds (inclined)

Outcrop, probable outcrop

Geological boundary (approximate, assumed)

Fault (approximate)

Dyke, sill

A — A' Line of section

Schematic trace of bedding, geological contact

Fossil locality

Geology by: R.R. IRRINKI and G.W. CROUSE
1983

LOCATION MAP

OSu

OSm

OSm

OSu

OSm

OSu

OSm

Os

OSm

Sotmon Brook

Price Brook

Brook

Traffon Brook

Wilson Brook

SISSON BRANCH RESERVOIR

ROCKY BROOK

Beaver Blk.

Dm

20'

47°15'

67°30'

25'

20'

15'

620000m E

630000m E

A

4000'

830'

0' M.S.L.

OSm

Os

McKENZIE GULCH FAULT

OSm

OSu

OSm

ROCKY BROOK

Dm

OSm

Ds

Ds

Ds

20'

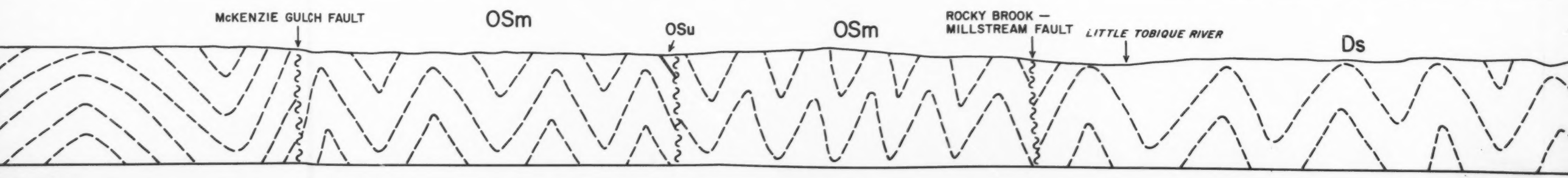
15'

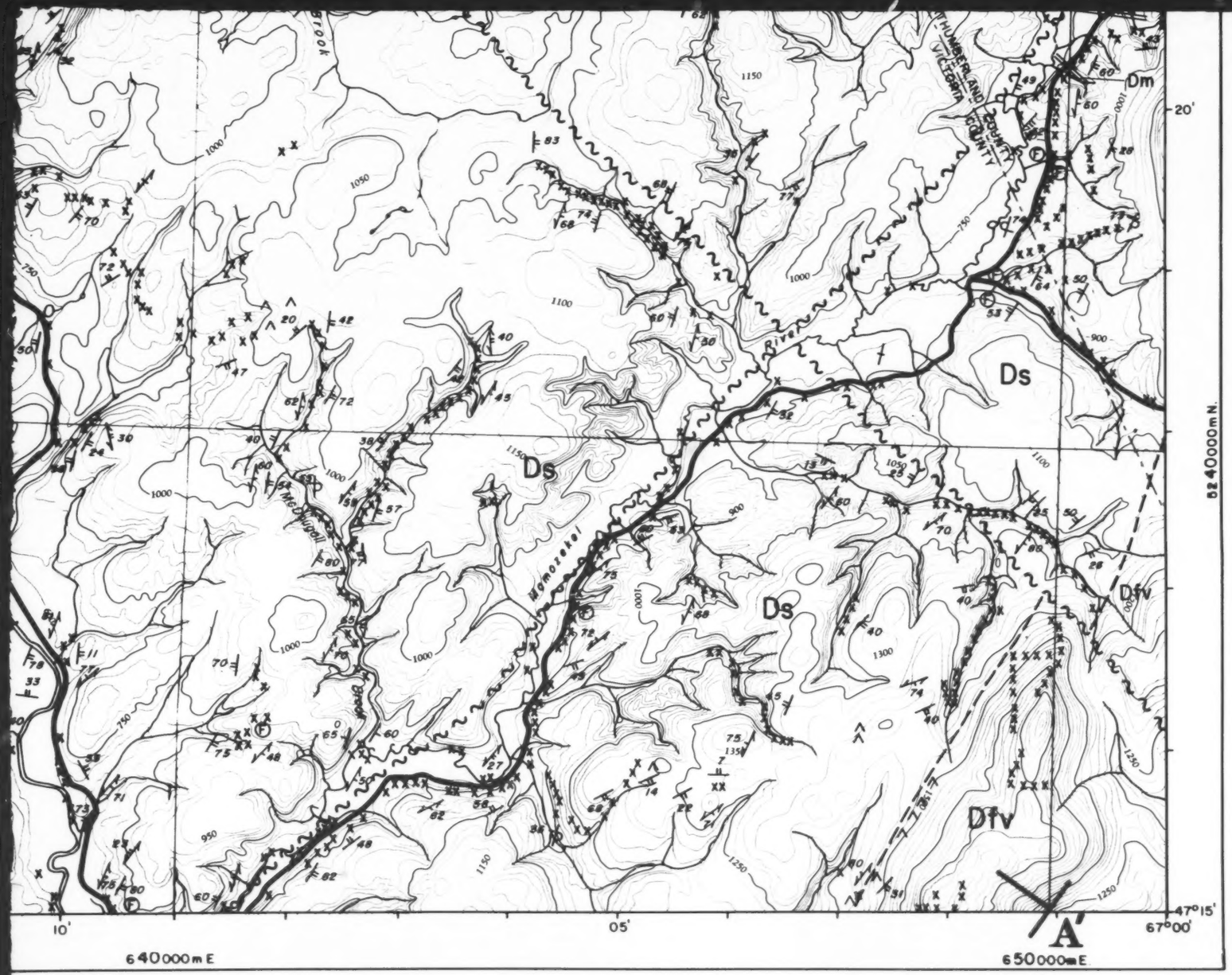
10'

05'

630000m E

640000m E





LOCATION MAP

contour interval: 50 feet

GEOLOGY OF SISSON BRANCH RESERVOIR

Miles 1 0 1 2 3 Miles

Metres 1000 0 1000 2000 3000 4000 Metres